General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

Produced by the NASA Center for Aerospace Information (CASI)

CR 151589

GENERAL ELECTRIC

HOUSTON, TEXAS TECHNICAL INFORMATION RELEASE

TIR 741-LSP-7019

FROM	TO
D. J. Grounds	J. M. Waligora

DATE	WORK ORDER REF:	WORK STATEMENT PARA:	REFERENCE:
12/15/77	MA-183TF	NAS9-15094	

SUBJECT

Final Report for

Contract NAS9-15094 - Physiological Design Requirements Document

(NASA-CR-151589) PHYSIOLOGICAL SPACECRAFT ENVIRONMENT DATA DOCUMENTATION Final Report (General Electric Co.) 7 p HC A02/MF A01 CSCL 06S

N78-14778

Unclas G3/52 55523

The attached Final Report is submitted in response to Contrac NAS9-15094, DRL-MA-183TF. This report summarizes the work performed under this contract and satisfies each specified contract task.

The contract resulted in the development of a document for physiological limits to elements of the space flight environment. The text of this document insofar as completed has been transmitted to the Contract Technical Monitor separately.

Dennis J. Grounds

D. J. Grounds

/db

RECEIVED JAN 1978

CONCURRENCES

Counterpart:

Life Sciences Projects Unit Manager: DGFitzjerrell

Engrg. & Advanced Programs Subsection Mgr. CWFulcher

DISTRIBUTION

J. M. Waligora/SD3 (6 copies)
Faye Henry/BC7
JSC Technical Library/JM6 (4 copies)
John T. Wheeler/AT3

ASD 4028

1.0 INTRODUCTION

This is a final report on NASA Contract NAS9-15094, Physiological Spacecraft Environment Data Documentation. The work performed under this contract was initiated 1 July 1976 and was originally scheduled to be completed by 1 July 1977. Two contract extensions have been issued for the convenience of the Government which places the delivery date on 15 December 1977 at no additional cost.

The overall objective of this contract was to document the physiological limits of exposure to environmental parameters encountered during space flight. The environmental limits which have been previously established were described in terms of acceptable physiological changes.

Further objectives of this contract were:

1. to make the description of the physiological limits and physiological responses maximally accessible and utilizable to the NASA medical team.

2 to consider the effect of a wide population variance on the established limits

4. to identify areas in which further research might be required.

2.0 CONTRACT TASKS

The specific contract tasks are described in this section of the final report. The task descriptions are identified by the title and number given in the contract work statements and include the following information:

1. A brief statement of the purpose and scope of the task.
2. Discussion of the results obtained.
3. Conclusions and recommended actions.
4. A discussion of unresolved problems and proposed possible course of action where results could not be obtained within the terms of the contract due to unresolved problems.

Task 4.1 Formulate the Data Book Outline

The purpose of this task was to formulate an outline for the completed data book. The outline was to be coordinated and approved by the Contract Technical Monitor and distributed to the NASA identified contributing medical specialists.

As a result of two preliminary meetings with the NASA Technical Monitor, a title was established for the final document. It shall be called Physiological Design Requirements.

A literature survey was conducted and several comprehensive sources were reviewed for organization, style, and level of detail. The contents breakdown of the Compendium of Human Response to the Aerospace Environment was selected as a basic model for this document. A complete outline for each of the twelve proposed chapters was formulated and coordinated with the Contract Technical Monitor within the contract schedule. A group of authors from NASA/JSC were selected as contributors and the proposed outlines were distributed at the first meeting of authors held on October 4, 1976. In addition to the chapter outlines, a guideline for authors was developed to clarify the intent of the document and the guiding principles and ground rules. This document was distributed with the proposed chapter outlines.

Task 4.2 Coordinate Data Book Outline Approvals

The purpose of this task was to consider suggested changes to the outlines from the authors of each section.

The final meeting of the authors was held in January 1977. Authors for four of the chapters had submitted revisions to the proposed outlines by that time. These suggestions were coordinated with the Contract Technical Monitor and approved outlines were produced. Authors of the remaining eight chapters were contacted and stated that the outlines as proposed were consistent with their intended chapter organization.

Task 4.3 Collect and Assemble Source Information

The purpose of this task was to coordinate with each contributing author to collect and assemble the source material to be documented. This coordination was to be conducted under the general direction of the NASA Technical Monitor.

A formal review process was established by NASA in order to satisfy the requirements for publication of the data book as a NASA Technical Memorandum and to assure a consistent level of quality in the finished product. The review process consisted of a preliminary review by the contractor to provide technical editing and adherence to established guidelines. The next review was to be given by a review committee composed of three permanent members and two guest reviewers selected from the remaining authors. The three permanent members were E. L. Michel, W. E. Hull, and J. M. Waligora. The contractor was to obtain a complete set of suggested revisions from the review committee and prepare a final draft from them.

In order to accomplish the reviews by the end of the original contract period a schedule was coordinated with the Contract Technical Monitor and provided to all of the contributing authors. During the early meetings with authors the role of the contractor in assembling the source material was explained in a presentation by the contractor. Consultation was required by NASA authors infrequently before the scheduled date of submittal. However, when required it was provided without exception. On least one occasion the contractor reviewed an existing document for a contributor and provided written comments on how it could be adapted to satisfy the requirements of the Physiological Design Requirements.

The proposed schedule for submittal of data book sections was not met with only two exceptions. A new schedule was prepared, approved, and distributed to data book contributors. When it became apparent that the new schedule would not be met, a letter was issued to NASA describing

the anticipated slippage of contract milestones. Also during this period, it became known that the intended authors of three sections of the document would be leaving JSC and could no longer be counted on to author these sections. A contract extension was issued for four additional months. By August 1977, three chapters had been submitted and a review committee meeting was planned.

The contents of the data book were altered to reflect the loss of the intended author. One section on the effects of light was eliminated and a section on acceleration was combined with the section on mechanical vibration. Authorship of the remaining section of the document on weightless was offered to Dennis Grounds, who was the technical editor under this contract.

By the end of the final contract period, after another extension of six weeks was issued, a total of five (5) of the originally proposed twelve (12) sections had been reviewed, collected, and assembled for final preparation. Two (2) additional chapters have been through the review process and have gone back to the authors for modification. After combining two of the remaining seven proposed sections, five have tentatively been shelved and one is still planned to be written, reviewed, and included in the final document. The status of unfinished sections is indicated in the final data book document prepared and delivered to the contract Technical Monitor. The final sections of the data book are shown in Table 1.

TABLE 1

	Title	Author
1.	Atmosphere	D. G. Horrigan
2.	Contaminants	H. L. Kaplan, Ph. D.
3.	Thermal Environment	J. M. Waligora
4.	Acceleration, Impact, and Vibration	J. M. Waligora (review only)
5.	Sound and Noise	J. L. Homick, Ph. D.
6.	Radio Frequency Radiation (including microwaves)	D. S. Nachtwey, Ph. D. (review only)
7.	Ionizing Radiation	(To be written)
8.	Weightlessness	D. J. Grounds

Task 4.4 Assure Data Completeness

The objective of this task was to review the material to identify the adequacy of the content, format, quality of graphics, etc.

The seven sections of the data book which have undergone the review process were reviewed by the technical editor before the review committee meetings. In four of the sections, the suggested changes were incorporated into the draft before the review committee copies were prepared. In the other three sections including one section authored by the Technical Editor, suggested revisions were given at the review committee meeting and incorporated before the final draft was prepared.

Task 4.5 Edit Source Material and Type First Draft

The objective of this task was to conduct technical editing and type draft material.

The available data book sections which had been reviewed, were edited and a final draft was prepared. The technical editing included checking the final copy against the review committee recommended revisions, assuring correctness of references, supplying SI units where others had been used, and assuring the quality of graphics. The prepared sections have been duplicated (20 copies) and delivered to the Contract Technical Monitor on 15 December 1977.

RECOMMENDATIONS

The data book will become a much more valuable tool to the intended users if the document is completed in the following way.

1. Complete the typing and copy preparation for the two reviewed sections consistent with the sections prepared under this contract.

2. Follow through with plans to have the section on Ionizing Radiation completed and prepared as in (1).

3. Consider proceeding with preparation of the sections on Magnetic Fields and Electric Currents as a combined topic and prepare as in (1).